Attorney Docket No. 22461.00

IN THE APPLICATION

OF

GEORGE CANNAN

FOR AN

EXTENSION FOR TOP OF REFRIGERANT CAN FOR DISPENSING WITHOUT A VALVE

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EXTENSION FOR TOP OF REFRIGERANT CAN FOR DISPENSING WITHOUT A VALVE

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

The present invention relates to air conditioning apparatus, and more particularly to a refrigerant delivery assembly for delivering refrigerant to an air conditioner from a canister containing pressurized refrigerant using a standard, reusable charging hose secured to a threaded dispensing cap.

2. DESCRIPTION OF THE RELATED ART

A common technique for adding refrigerant to an automobile air conditioning unit is to connect a charging hose assembly between a suction line service fitting on the air conditioning unit and a small canister containing refrigerant, and then allowing the refrigerant to flow through the charging hose into the air conditioning unit. The conventional charging hose assemblies include a charging hose, a shutoff valve connected to one end of the hose and a disconnect coupler fitting secured to the other end of the hose. The shutoff valve is screwed onto a threaded outlet portion disposed on the top surface of the

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canister and the coupler fitting is secured to the service fitting on the air conditioning unit. The lever on the top of the valve is rotated to lower a piercing pin member located inside the valve. The pin member pierces the outlet portion of the canister. The lever on the valve is then rotated in the opposite direction to allow the charging hose to communicate with the interior of the canister. This allows the contents of the canister to flow through the charging hose into the air conditioning unit.

Several problems exist with the current method for adding refrigerant to an automobile cooling system. One problem is that there is a high possibility of discharging an undesirable amount of refrigerant into the atmosphere. If the disconnect coupler fitting is removed before the shutoff valve is closed, all of the remaining refrigerant in the canister will escape into the atmosphere. Another problem with the current method is that it is extremely time-consuming to have to add the valve to each canister of coolant and then secure the standard charging hose onto the valve. Finally, an additional problem with the present delivery method is that is difficult to control the amount of refrigerant being added into the air conditioning unit.

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The following patent documents disclose inventions improving on the current automobile refrigerant delivery methods or methods and devices for discharging other materials from an aerosol type canister.

Several patents disclose improved distribution caps for monitoring the amount of pressurized material being released from an aerosol type canister. European Patent 49,180, published on April 7, 1982, discloses a one-piece distribution cap for a pressurized container and its assembly. United Kingdom Patent 2,097,061, published on October 27, 1982, discloses an actuator cap for pressurized dispensers. United States Patent number 3,314,576, issued on April 18, 1967 to Focht et al., discloses a cap for dispensing aerosols. German Patent 4,303,157, published on August 11, 1994, discloses an actuating device for metering closure of a pressurized container. Each of the above caps includes an integrated push button or lever that is manually depressed to release a portion of the contents of the pressured canister. The portion of the contents that is released is regulated by the duration that the push button or lever is depressed.

Several patents disclose devices for, and methods of, adding refrigerant to an automobile air conditioning unit using

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shutoff valves as discussed above. United States Patent number 6,385,986, issued on May 14, 2002 to Ferris et al., discloses a refrigerant charging hose assembly. United States Patent No. 6,481,221, issued on November 19, 2002 to Ferris et al., and United States Patent Publication number 2002/0189265, published on December 19, 2002, each disclose an apparatus, methods and compositions for placing additive fluids into a refrigerant circuit. United States Patent number 6,360,554, issued on March 26, 2002 to Trachtenberg, discloses a single can automotive air conditioner refill and treatment. Each of these patent documents discloses a device for adding refrigerant to an automobile air conditioning unit using a shutoff valve that is screwed to the top of the canister.

United States Patent number 4,895,190, issued on January 23, 1990 to Gillen, discloses an actuator and hose assembly for aerosol containers. The actuator includes a fluid hose having a conventional fitting at one end for coupling the hose with a fluid receiver and an actuator sub assembly coupled to the other end of the hose. The sub assembly comprises an actuator cap sealed to the top of a canister having a press down actuator for releasing the contents of the canister. The hose is connected to the actuator by a hose connector.

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United States Patent Number 4,941,600, issued on July 17, 1990 to Berriochoa et al., discloses a dispenser lock assembly for a pressurized container. The lock assembly locks the valve stem of an aerosol container in the open position. The lock assembly includes a cap with an interior recess and an actuator tab connected to the cap and extending across the valve stem within the interior recess. A hook portion is provided on a ring lock for engaging the tab when the tab is depressed to move the valve to the open position.

United States Patent number 5,305,784, issued on April 26, 1994 to Carter, discloses a tire inflation hose assembly. The hose assembly connects a container of pressurized tire inflation material and a valve system of a tire. The hose assembly includes a release valve assembly for coupling to the container and for releasing the pressurized material contained inside. A tube transports the released material to a nozzle that is adapted for matting with the valve stem of the tire.

United States Patent number 5,611,466, issued to Hsiao on March 18, 1997, discloses a releasing unit for a container in which a pressurized material is enclosed. The releasing unit has a cap a nozzle assembly with a hose portion. The nozzle assembly is engaged to a releasing valve of the container and

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the cap has a skirt portion mounted to a top of the container and having a slot defined in the skirt portion for the hose to extend through.

United States Patent number 6,382,469, issued on May 7, 2002 to Carter et al., discloses a tire inflation actuator. The actuator has a body that is securable to container of pressurized material. The actuator includes a depressible finger tab for releasing the contents of the container and a latch for releasably securing the tab in a depressed position. A hose is secured to the actuator for delivering the contents of the container.

None of the above mentioned patents disclose an actuator cap having a threaded projection for receiving the threaded connector of a conventional refrigerant charging hose.

None of the above inventions and patents, taken either singly or in combination, is seen to describe the instant invention as claimed. Thus an extension for the top of a refrigerant can for dispensing without a valve, thereby solving the aforementioned problems, is desired.

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SUMMARY OF THE INVENTION

The extension for the top of a refrigerant can for dispensing without a valve is used for supplying refrigerant to the air conditioning unit of a vehicle engine. The extension for the top of the can is adapted for using a conventional refrigerant charging hose for delivering the contents of the can to the air conditioning unit. The extension also allows the same charging hose to be reused several times. The extension allows the contents of the refrigerant can to be delivered to a vehicle without having to attach a conventional shutoff valve to the top of the canister.

The present invention includes a seal over the opening in the top of the refrigerant can. The seal includes an aerosol valve stem that extends through the center of the seal. The extension includes an actuator cap that fits over the seal on the top of the canister. The actuator cap houses an actuator for releasing the contents of the container. The actuator has a depression tab that is hingedly connected to the interior of the actuator cap. When a pressing force is applied to the depression tab, the valve stem is forced downward, releasing a controlled portion of the contents of the refrigerant canister.

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The actuator cap also has a threaded projection extending outward from its front surface. The threaded projection is adapted to receive a threaded connector on a first end of a conventional refrigerant charging hose. The charging hose is connected in fluid communication with the valve stem through a channel in the projection so that as the contents of the refrigerant canister are released, the contents are directed through the charging hose to the vehicle.

Accordingly, it is a principal object of the invention to provide an extension for the top of a refrigerant canister that does not require securing a conventional shutoff valve to the top of the canister.

It is another object of the invention to provide an extension for the top of a refrigerant canister that allows a conventional refrigerant charging tube to be secured to the canister and then reused with subsequent canisters.

It is a further object of the invention to provide an extension for the top of a refrigerant canister that allows the user to easily regulate the portion of the canister contents that is released.

It is an object of the invention to provide improved elements and arrangements thereof for the purposes described

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which is inexpensive, dependable and fully effective in accomplishing its intended purposes.

These and other objects of the present invention will become readily apparent upon further review of the following specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an environmental, perspective view of an extension for the top of a refrigerant can for dispensing without a valve according to the present invention.

Fig. 2 is a perspective view of the extension for the top of the refrigerant can according to the present invention.

Fig. 3 is an exploded, perspective view of the extension for the top of the refrigerant can according to the present invention.

Fig. 4A is a top view of an actuator cap of the extension for the top of the refrigerant can according to the present invention.

Fig. 4B is a side cross-sectional view of the actuator cap of the extension for the top of the refrigerant can according to the present invention.

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Similar reference characters denote corresponding features consistently throughout the attached drawings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is an extension for the top of a refrigerant can for dispensing the contents of the can without the use of an attachable shutoff valve. The present invention may be designed as an extension that will be added to a pre-existing refrigerant canister, or as a new refrigerant canister having the discharging extension secured to the top of the canister. According to the preferred embodiment of the present invention, the extension is designed for delivering refrigerant from a pressurized canister to the air conditioning unit of a vehicle. Fig. 1 is an environmental perspective view of the refrigerant canister with the discharge extension 10 secured to a vehicle air conditioning unit.

Fig. 2 is a perspective view of the refrigerant can with extension 10 according to the present invention. The refrigerant can with extension 10 generally comprises a pressurized fluid canister 20 with an actuator cap 30 attached to the top of the canister 20. According to a preferred embodiment of the present invention, the pressurized fluid

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canister 20 contains vehicle air conditioning refrigerant. Fig. 2 further depicts a conventional refrigerant charging hose 60 secured to the actuator cap 30. The refrigerant can with extension 10 may be designed with the charging hose 60 integrally secured to the actuator cap 30, or preferably, the refrigerant can with extension 10 may be designed to receive a pre-existing charging hose 60 so that the charging hose 60 may be removed and reused with subsequent refrigerant cans 10.

Fig. 3 is an exploded perspective view of the present invention 10 depicting its individual elements. The refrigerant can with extension 10 comprises the refrigerant canister 20, a canister cover 70, an actuator cap 30, and an actuator cap lid 50. The canister 20 has vertical sidewalls forming a generally cylindrical main body 20 with a sloped top end and a bottom end 22. A canister opening 26 is disposed in the center of the top end. The top end has an upstanding rim 24 surrounding the opening 24. The upstanding rim 24 is adapted for securing the actuator cap 30 to the can.

The canister cover 70 is disposed over the opening 26 in the top of the canister 20. The canister cover 70 has a circular lip portion 72 that is disposed around the entire circumference of the canister cover 70. The lip portion 72

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mounts the canister cover onto the upstanding rim 24 on the canister 20 to form a seal that prevents the contents of the canister 20 from escaping. The canister cover 70 has a conventional upwardly biased and extending, axially movable, tubular aerosol valve stem 74. The valve stem 74 extends through the center of the canister cover 70 having a bottom portion 76 that extends into the canister 20. The valve stem 74 is upwardly biased by the pressure of the contents of the canister 20, and may also be additionally biased by a biasing means, such as a spring (not shown). The valve stem 74 is coupled inside of the canister cover 70 so that when the stem 74 is shifted or moved downwardly, the contents of the canister 20 are released. When downward pressure on the stem 74 is removed and the stem 74 is released, the stem 74 is upwardly biased by the pressure inside of the canister 20 so that it returns to its original position to prevent further release of the canister 20 contents.

The actuator cap 30 comprises a generally cylindrical bottom skirt portion 31 having an overall diameter, and further comprises an upper rim portion 34 having an overall diameter that is slightly smaller than that of the bottom skirt portion 31. The lower skirt portion 31 is adapted for mounting the

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actuator cap 30 onto the canister 20. The interior of the bottom skirt portion 31 is hollow, defining an opening along the bottom edge 32 of the actuator cap 32. The bottom edge 32 of the actuator cap 30 frictionally engages the upstanding rim 24 of the canister 20 to securely mount the actuator cap 30.

The upper rim portion 34 extends from the lower skirt portion 31 and provides an aperture or a top opening for accommodating a depressible actuator tab 36. The upper rim portion 34 does not extend around the entire outer periphery of the actuator cap 30 in order to provide a recess in the rim portion 34, as shown in Fig. 3. The recess provides access to the actuator tab 36. The actuator tab 36 is pivotally secured to the actuator cap 30 by a flexible actuator hinge 40 (shown in Fig. 4A).

The actuator cap 30 further comprises a threaded projection 38 that extends outwardly from the upper rim portion 34 of the cap 30. The threaded projection 38 is adapted for receiving a threaded connector of a discharge tube for delivering the released contents of the canister 20 to the air conditioning unit of a vehicle. The threaded projection 38 includes an opening 39 that allows the released contents of the canister 20 to pass out of the actuator cap 30. Preferably, the threaded

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projection 38 has a diameter of 7/16 inches and a pitch of 20 threads/inch to accommodate an automobile air conditioning unit. For alternative applications the threaded projection has a diameter of 8/16 or 1/2 inches and a pitch of 16 threads/inch. These dimensions, however, are only exemplary and do not limit the threaded projection 38. The dimensions of the threaded projection 38 may be altered to accommodate any fastener.

The actuator cap lid 50 is an openable, protective cover that is secured to the actuator cap 30. The lid 50 has a flat top surface 54 that prevents incidental depression of the actuator tab 36 when the invention 10 is not in use. The lid 50 further comprises a open bottom portion 52 that is adapted for releasably fitting over the upper rim portion 34 of the actuator cap 30. The lid 50 is hingedly secured to the actuator cap 30 by a hinge 55 disposed along the lid 50.

Fig 4A is a top view of the actuator cap 30. The actuator tab 36 is a depressible tab that is pressed downward by the user's finger. The top surface of the actuator tab 36 includes a plurality of finger gripping grooves 37. The gripping grooves 37 provide a frictional surface for the user's fingers. The actuator tab 36 is secured to the cap 30 by hinge 40. The hinge 40 allows for movement of the actuator tab 36 between an

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unactuated position and a depressed actuated position. In the depressed actuated position the valve stem 74 is actuated to release the contents of the canister 20.

Fig 4B is a side cross sectional view of the actuator cap 30. A stem receiving orifice 33 is disposed on the bottom of the actuator tab 36. When the actuator cap 30 is positioned on the top of the canister 20, the stem receiving orifice 33 engages the top of the valve stem 74. The actuator cap 30 further comprises a discharge channel 35 that extends through the center of the threaded projection 38 to the discharge opening 39. The discharge channel 35 is in fluid communication with the valve stem 74 so that as the contents of the canister 20 are released through the valve stem 74 the discharge channel 35 will transfer the contents out of the discharge opening 39.

The actuator cap 30 may optionally include an integrated locking mechanism. The locking mechanism holds the actuator tab 36 in a depressed actuated position without the user having to hold his finger on the tab 36. The locking mechanism preferably comprises a lock hook 42 that is integrally formed in the skirt portion 31 of the actuator cap 30. The locking mechanism also comprises a lock engaging hook 44 on the bottom of the actuator tab 36. Once the actuator tab 36 is depressed to a certain

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degree, the engaging hook 44 engages the lock hook 42 to lock the actuator tab 36 in place.

Fig. 3 depicts a conventional refrigerant charging hose 60. The charging hose 60 is a conventional hose used my mechanics for delivering refrigerant to the air conditioning unit of a vehicle. The charging hose 60 comprises an elongate tubular main body 61 having a receiving end 62 and a discharge end 63. A threaded fitting 64 is secured to the receiving end 62 of the charging hose 60. The threaded fitting 64 engages the threaded projection 38 of the actuator cap 30. A disconnect coupler fitting 66 is secured to the discharge end 63 of the charging hose 60. The disconnect fitting 66 is a conventional fitting that is adapted to couple with the recharging nipple on a vehicle air conditioning unit. The canister with extension 10 may be designed with a discharge hose integrally mounted to the threaded projection 38. This would require, however, that a new hose be used every time a new canister was used. According to one preferred embodiment of the present invention the threaded projection 38 is adapted to engage the threaded fitting 64 of a pre-existing conventional charging hose 60 so that the charging hose 60 may be removed and re-used with subsequent canisters 20.

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To operate the refrigerant canister with extension 10 the user must first secure the actuator cap 30 to the top of the canister 20. Next the threaded fitting 64 of the charging hose 60 is secured to the threaded projection 38 of the actuator cap 30. The lid 50 is then removed revealing the actuator tab 36. The user than depresses the actuator tab 36 to engage the valve stem 74 and to release a portion of the canister's 20 contents. The user may hold the actuator tab 36 down manually or use the locking device to hold the tab 36 in the actuated position. The present invention 10 allows the user to regulate the portion of the contents that is being released. If the user only needs to deliver a small amount of refrigerant to a vehicle, then once the desired amount of the contents is discharged, the user simply removes pressure from the actuator tab 36 and replaces the lid 50 for later use.

According to certain aspects of the present invention 10, the actuator cap 30 may be designed in two different forms. The actuator cap 30 may be made pre-attached to a new canister 20. The actuator cap 30 may also be made as an attachment for a pre-existing canister 20. The actuator cap 30 is capable of fitting onto any conventional aerosol type canister.

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It is to be understood that the present invention is not limited to the embodiments described above, but encompasses any and all embodiments within the scope of the following claims.

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